present reviewer, standing in the museum of which he is the director, was engaged in a lively conversation with Col. Roosevelt about the evolution of mammalian life in North America. A score of newspaper reporters surrounded the speakers, and one of them subsequently published an account in which he said that a most astonishing conversation in language absolutely unintelligible to the listeners took place between the ex-president and the director of the museum.

The publication of such works as that which has appeared from the pen of Mr. Knipe will tend in the future to make the subject more intelligible to the ordinary reader and the association of the names of things with splendid illustrations of them must familiarize the public with the whole subject.

Too much praise can not be bestowed upon the fine plates which adorn the volume. They are the product of the facile pencil of Miss Alice B. Woodward, the talented daughter of Dr. Henry Woodward, the late curator of geology and paleontology in the British Museum, and Mr. Ernest Bucknall. A few of these originally appeared in the author's first volume, but the great majority are new.

W. J. HOLLAND

NOTES ON METEOROLOGY AND CLIMATOLOGY

A RAINLESS APRIL IN ENGLAND

APRIL last was the driest month on record over a large part of England. In London but 0.04 inch of rain fell, making this month the driest of that name in about a century and a half, which is the length of the record. In the last half-century only one month, February, 1891, had less precipitation. At another station, Bromley, where a record has been kept since 1869, April, 1912, was the first month in which *no* precipitation was recorded.

THE RECORDING OF EARTHQUAKES

IT is particularly unfortunate that congress did not see fit to make an appropriation for the inauguration of seismological work under the auspices of the U. S. Weather Bureau. Two seismographs have been in operation at the central office in Washington for a number of years, but no work of this character has been done at any of the other stations, notwithstanding the general call from a number of sources that the weather bureau engage in this important work. While not strictly meteorological in character this work is carried on by the weather services of most countries, principally because in each country it is the one government scientific bureau having permanent stations at scattered points, with a trained body of observers to conduct the work. In the United States good work has been done by various educational institutions, particularly those of the Jesuit order. However, it has been the experience of other countries that seismological observations can be obtained to greatest advantage by a government bureau through the use of standard instruments, permanently established and having similar environments. In the United States the weather bureau seems best equipped for such work.

THE ATMOSPHERE AT GREAT HEIGHTS

LUMINOUS phenomena like meteor trains and auroras at heights of 200 kilometers (124 miles) or more have long proved the existence of some atmosphere, however tenuous, even at these great heights. According to Professor W. J. Humphreys, the atmosphere at a height of 150 kilometers (93 miles) consists of 99.73 per cent. (by volume) of hydrogen and 0.27 per cent. of helium, with a total pressure of 0.0043 in millimeters of mercury. As a result of recent investigations, Dr. A. Wegener concludes[1] that there is an atmosphere of perceptible density even up to 500 kilometers (311 miles) and that in the highest strata there must be an unknown gas in addition to and lighter than hydrogen. He suggests that this gas be called "geocoronium" because of its similarity to "coronium" which is supposed to exist in the atmosphere of the sun.

[1] *Himmel und Erde*, July, 1912.

FREE AIR DATA IN FORECASTING

WHEN the exploration of the upper air by means of kites and balloons was first attempted about fifteen years ago, many meteorologists with more enthusiasm than judgment stated that forecasting would soon be simplified because of the upper air data thus derived, and that the weather of a week or a month ahead would be foretold with as great certainty as that for the next 36 hours was then predicted. However, the application of the knowledge gained from soundings in the free air has not been a simple matter. In fact the problem has been a very complex one, and thus far investigations in aerology have been mainly along the lines of pure science. The normal condition of the free air is just now beginning to be understood, and as yet, abnormal conditions and their relation to subsequent weather changes at the ground have not been thoroughly investigated. Various changes aloft, particularly those relating to wind velocity and direction, frequently become apparent at the ground six to eight hours later. If this is generally true, weather data from aloft will never be particularly serviceable to the forecaster because of the short time interval involved. At Mount Weather Observatory, one of the best equipped aerological stations in the world, attempts have been made, with fair success, to use the data from aloft in connection with the Washington forecasts. Moreover, after the weather maps have been drawn the free air conditions preceding and accompanying the weather at the ground have been studied with a view of determining the forecasting value of the data from aloft. That the hopes expressed fifteen years ago have not yet been realized may be seen from the following statement of Professor A. J. Henry,[2] Executive Officer of the Observatory:

> While a large number of barometric depressions passed over Mount Weather during the month (March), a careful study of the upper air data on the day previous to the advent of each depression does not show, as yet, that decided changes are in progress whereby the course or the intensity of the depression might be inferred.

[2] *Monthly Weather Review*, March, 1912, p. 473.

PERIODICITY IN PRESSURE VARIATIONS

WELL-MARKED periods of three and one half years have been observed in the pressure variations at Port Darwin, in the northern part of Australia. From a study of the mean monthly values for 1878 to 1911, Dr. C. Braak[3] finds that similar changes also occur in India and throughout the Malay Archipelago, and associated with them are variations of temperature with maxima half-way between the maxima of pressure. It has generally been supposed that solar changes account for the temperature variations, which in turn produce variations in pressure. However, when the temperatures and pressures are plotted it appears that a pressure wave resembles the temperature wave which follows it rather than the one which precedes it, indicating that the changes in pressure cause the changes in temperature, and not conversely. Dr. Braak describes the process somewhat as follows: Through some cause pressure becomes high over the region. The wind thereupon becomes feebler and the air takes less part in the general circulation than usual. Diminished air circulation means diminished oceanic circulation; consequently air and water become relatively stagnant, and are hence subject to the continued action of the tropical sun, which gradually increases the temperature, and finally produces a maximum in the temperature curve. The increase goes on until the effect of the high temperature on the pressure is to diminish it and eventually to replace it with a generally low pressure. Conditions are now reversed, for low pressure means increased wind velocity, and a considerable interchange of air and water between equatorial and temperate regions, resulting in a lowering of temperature in the equatorial region. Ultimately this temperature change increases the pressure, until high pressure is once more restored and the cycle begins again. The pressure and temperature changes are

[3] *Meteorologische Zeitschrift*, Vol. 29, pp. 1–7.

thus ascribed to terrestrial and not to solar influence.

THE NEED OF A METEOROLOGICAL LABORATORY

PROFESSOR CLEVELAND ABBE, who in January last was awarded the Symons Gold Medal by the Royal Meteorological Society for his contributions "to instrumental, statistical, dynamical and thermodynamical meteorology and forecasting," has communicated an interesting paper to the Franklin Institute, Philadelphia, on "The Obstacles to the Progress of Meteorology." In it he says that even if we had perfect observations and records for ages past, with free air data up to heights of ten or fifteen miles, together with daily weather maps for the whole northern hemisphere, perfect weather predictions could not now be made because of "our ignorance of many details as to the laws that govern the atmosphere and our inability to put even what little knowledge we have into such a form that it can be perfectly utilized by the forecaster." He shows that in every branch of science progress has been accomplished mainly through laboratory observation and experiment, guided by the spirit of mathematics. He therefore says in concluding:

> What I most long to see, and what I believe is of fundamental importance in atmospherics—the want of which is a real obstacle—is the existence of a laboratory building specifically adapted to atmospheric experiments, and the association therewith of able students trained in mathematics, physics and mechanics. When all this is realized the intellectual work that will there be done will gradually remove all obstacles to the eventual perfection of our knowledge of the atmosphere.

NEW BOOKS

AMONG the books which have recently appeared are: (1) "Climate and Weather," by H. N. Dickson. London, Williams and Norgate, 8vo, 256 pp., 1s. net. (2) "Instructions Météorologiques," by Alfred Angot. 5th edition. Paris, Gauthier-Villars, 8vo, 161 pp. (3) "International Catalogue of Scientific Literature"—"Meteorology, including Terrestrial Magnetism." London, Harrison and Sons, 8vo, 238 pp., 15s. (4) "Atlas Photographique des Nauges," by J. Loisel. 8 pp. + 10 pl., Paris, G. Thomas, 18 fr. (5) "The Structure of the Atmosphere in Clear Weather: a Study of Soundings with Pilot Balloons," by C. J. P. Cave. 4vo, 144 pp., Cambridge University Press, 10s. 6d. net. (6) "Meteorological Instruments and Weather Forecasts," by H. T. Davidge. London, P. Marshall and Co., 6d. net. (7) "Barometers and the Measurement of Atmospheric Pressure," by C. F. Marvin. 4th edition, 8vo, 110 pp., Washington, U. S. Weather Bureau, Instrument Division, Circular F. (8) "Evaporation from Irrigated Soils," by S. Fortier and S. H. Beckett, 8vo, 77 pp.. Washington, U. S. Office of Experiment Stations, Bulletin 248.

ANDREW H. PALMER
BLUE HILL OBSERVATORY

SPECIAL ARTICLES

THE PHYSIOLOGICAL SIGNIFICANCE OF THE SEGMENTED STRUCTURE OF THE STRIATED MUSCLE FIBER

THE question of the physiological significance of the segmented structure of striated muscle fibers remains for most physiologists one of the standing enigmas of their science. What relation—if any—has this structure to the power of rapid and instantly reversible contraction which is the distinctive peculiarity of this tissue? No entirely satisfactory answer to this question has hitherto been found; those which have been proposed are as diverse as their authors' conceptions of the ultimate of the difficulty lies here. The histological literature is full of contradictions and hence —since all can not be right—of misinterpretations. Before agreement can be reached on the physiological question, it is evident that a clear and satisfactory conception of the essential structure of the living muscle-cell is necessary. Many of the structural minutiæ visible in histological preparations vary according to the nature of the treatment accorded the tissue. Their physiological significance is thus doubtful. During recent years